DOCUMENT RESUME

ED 291 786 TM 011 071

AUTHOR Peck, Hugh I.
TITLE The Effects of the Level of Content Preparation on the Performance of Mathematics Teachers on Their NTE Specialty Area Examination.
PUB DATE Nov 87
NOTE 33p.; Paper presented at the Annual Meeting of the Mid-South Education Research Association (Mobile, AL, November 12, 1987).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Licensing Examinations (Professions); *Mathematics Teachers; Secondary Education; *Teacher Certification; Teacher Education
IDENTIFIERS *National Teacher Examinations

ABSTRACT

A study involving 123 teachers newly certified in mathematics during the 1985/86-1986/87 school years was undertaken to investigate the relationship among three common assessments of achievement often used in the certification of teachers of mathematics. The study also sought to determine whether a level of content preparation can be inferred from the teacher's score on a cognitive achievement test in their area of specialty. The study followed Campbell's data analytic design. Data were taken from records in the Office of Teacher Certification in the Department of Education in one Mid-South state. Data were extracted from subjects' scores on the National Teacher Examinations (NTE) and an instrument that elicited the teachers' level of academic preparation (level of content preparation). The results indicate that teachers' scores on the NTE Mathematics Specialty Area Test increased as the level of content preparation increases, when the NTE General Knowledge Score was controlled. It appears that the number of hours of mathematics taken as a part of teacher preparation was significantly more important to mathematics achievement than was general knowledge. (TJH)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED291786

# The Effects of the Level of Content Preparation on the Performance of Mathematics Teachers on Their NTE Speciality Area Examination

by

Hugh I. Peck

Bureau of Education Research for Education

Mississippi State University

Box 5365

Mississippi State, MS 39762

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Hugh Peck

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

TM011 071

A paper presented at the Mid-South Education Research Association

November 12, 1987

Mobile Alabama

# The Effects of the Level of Content Preparation on the Performance of Mathematics Teachers on Their NTE Speciality Area Examination

## I. Statements of the Problem

The purpose of this research was to study the relationship, if any, among three common assessments of achievement often used in the certification of mathematics teachers. The study further sought to determine if a level of content preparation can be inferred from the teacher's score on a cognitive achievement test in their area of speciality. Two questions were examined in this study. Question one was: When controlled for general knowledge, will the teacher's score on a mathematics achievement test increase as the level of content preparation increases? Question two was: Can a level of content preparation be successfully inferred from performance on a cognitive tests of achievement in the teachers speciality area?

## II. Introduction

Traditional programs of teacher preparation have required training in a content area and in pedagogy Adelman (1986), AACTE (1987), Everston, Hawley & Zlotmik (1985). Emerging teacher certification practices, however, appear to be based on the assumption that content knowledge is of primary importance to teachers

Patton (1985) Roth (1986), and Cornett (1983). Analysis of content level of preparation are infrequent Hawk et al. (1985). Some who certify teachers seem to be saying that formal instruction in pedagogy is unnecessary or of minor importance AACTE (1987), Adel (1986), and Reports of the NJ Commission (1984). However, the issue, though unsettling, is for from settled AACTE (1985). The AACTE (1987) researchers have carefully reviewed the certification policy of all 50 states. Adelman (1986) writing for the Policy Studies Associates reviewed 20 programs of alternate routes to teacher certification. The AACTE Researchers refer to these as "irregular" certification procedures. The authors found only one study, Hawk et al. (1985), that looked at the relationship of certification to teachers or student performance. No study was found that tried to relate teachers' achievement scores in their teaching area to their teacher content preparation.

The changing world of teacher certification is not adequately anchored to a research base. This research efforts can add one piece to the puzzle concerning irregular routes to teacher certification by examining the relationships among teacher content preparation, teacher general knowledge, and test achievements in their speciality area.

## III. Methods

### Research Design

The research paradigm is a modification of Campbell's (1966) "data analytic design". Ary, et al. (1985) definition seem to be more explicitly when they call such research "ex-post facto, so characterized because variations in the independent variables have already been determined in the natural course of events." (p. 123). In the mathematics teacher preparation and certification process, college courses in the area of preparation are normally taken and the credits forwarded to the SEA Certification Office. Likewise, before certification many teachers must submit their NTE scores on the Core and the Speciality Area tests. The results of the NTE and the courses credits are analyzed and the certification issued or rejected.

Thus, the research report is an analysis of an existing data sets gather for a specific longitudinal study but separately analyzed for this paper. Obviously this is not experimental research in the normal sense. To some extent the design is correlational, since we must carefully consider the intercorrelations among the three variables. But these parts of the design are tangent to the main purpose of the research.

Subjects

The population for this study consisted of 123 teachers newly certified in mathematics during the 1985-86 and 1986-87 school years. The data were taken from records in the Office of Teacher Certification in the State Department of Education in one mid-south state. Data were reported to the Bureau of Education Research and Education in the College of Education at Mississippi State University on a Teacher Demographic Form. The form was prepared for a longitudinal study on the impact of certification on the performance of mathematics teachers. Teachers were included in this study regardless of their certification status or their route of entry into the teaching profession, the only requirement was that the teacher was new to teaching mathematics in the fall of 1985 or 1986.

Instrumentation

Teachers applying for certification must present their scores in the NTE, whether core or common, and on their specialty area. Educational Testing Service (1985) owns the NTE and administers it for NTE Board of Directors. NTE is the most commonly used test of teacher certification in our nation ETS (1985). Among the NTE scores recorded for teacher applicants are General Knowledge and Mathematics Specialty Area Tests.

The titles of both test explain their general purposes. Those purposes are applicable to this study.

The "level of content preparation" instrument was designed specifically for the longitudinal study and was based on course requirements for mathematics certification in the state. The instrument was designed on a scale of one to ten, with 10 being the highest most complex level of preparation. The following scale definitions were used:

1. 0-18 semester hours of general mathematics. Includes courses covering topics such as introductory content (e.g., introduction to algebra), fundamentals of algebra, number systems, informal measurement, or other lower level (freshman and sophomore) mathematics courses which DO NOT ADDRESS COLLEGE-LEVEL ALGEBRA, TRIGONOMETRY, GEOMETRY OR CALCULUS CONTENT.

2. 6 semester hours of college algebra and trigonometry or equivalent (e.g., functions introduction to calculus.

3. 7-17 semester hours of mathematics content. Includes courses covering college algebra, trigonometry, geometry, measurement, or other lower level mathematics courses; calculus, linear algebra, college geometry, probability, statistics, or other upper level mathematics courses. DOES NOT INCLUDE ANY HOURS IN GENERAL MATHEMATICS CONTENT.

4. 18-23 semester hours of mathematics content. Includes courses covering college algebra, trigonometry, geometry, measurement, or other lower level mathematics courses; calculus, linear algebra, college geometry, probability, statistics, or other upper level or mathematics courses. DOES NOT INCLUDE ANY HOURS IN GENERAL MATHEMATICS CONTENT.

5. 24-30 semester hours of mathematics content.
   Includes courses covering college algebra, trigonometry, geometry, measurement, or other lower level mathematics courses; calculus, linear algebra, abstract (modern) algebra, college geometry, probability, statistics, or other upper level or graduate level mathematics courses. DOES NOT INCLUDE ANY HOURS IN GENERAL MATHEMATICS CONTENT.

6. B.A. in mathematics OR 31-41 semester hours of mathematics content.
   Includes courses covering college algebra, trigonometry, calculus, linear algebra, abstract (modern) algebra, college geometry, differential equations, probability and statistics, numerical analysis, or other upper level or graduate level mathematics courses. DOES NOT INCLUDE ANY HOURS IN GENERAL MATHEMATICS CONTENT.

7. B.S. in mathematics OR at least 42 semester hours of mathematics content.
   Includes courses covering college algebra, trigonometry, calculus, linear algebra, abstract (modern) algebra, college geometry, differential equations, probability and statistics, numerical analysis, or other upper level or graduate level mathematics courses. DOES NOT INCLUDE ANY HOURS IN GENERAL MATHEMATICS CONTENT.

8. M.A. or M.S. in Mathematics or Ed.S. in Secondary Education with emphasis in mathematics.

9. Up to 30 semester hours of mathematics above the master's degree.

10. More than 30 semester hours of mathematics above the master's degree.

Analyses

Response to the first research of question posed, "When controlled for general knowledge, will the teacher's score on a mathematics test increase as the level of content preparation increases?", was determined by a stepwise multiple regression procedure. "First,

stepwise procedure identifies the independent variable most highly correlated with the dependent variable. Next, variables are added one step at a time." Mason, R.D., Lind, P.A. & Marshal, W. G. (1983, p. 449).

Since the study considered only two independent variables, general knowledge and level of content preparation and one dependent variable mathematics achievement, the equation effectively forced NTE General Knowledge as the variable with the highest correlation. A series of statistical outcomes that are useful in any analysis are outputs from these analysis; a correlation matrix, partial correlations, the coefficient of multiple determination are among those by-products.

Responses to the second research questions, "Can a level of content preparation be successfully inferred from performance on a cognitive achievement test?", was determined from a careful examine of the correlation matrix and by using step regression. However, in this analysis level of content preparation was the dependent variable and NTE General Knowledge as well as NTE Math Specialty score were used as independent variables. To confirm a response to research question 2; the 123 subjects were placed in groups 1 through 10 based on their level of content preparation and NTE Math were means computed for those cells.

## Results

### Research question #1

When controlled for general knowledge, will teacher's score on a mathematics achievement test increase as the level of content preparation increases?

### Evidence

This study used the General Knowledge subscale of the NTE (NTESC2) as the measure of general knowledge; the score on the NTE Mathematics Speciality Area Examination (NTEMSC) as the measure of mathematics achievement; and the Level of Content Preparation Scale (see page 6) (MHRS). Using Stepwise Multiple Regression the NTEMSC was entered on the SPSS/PC+ analysis program as the dependent variable. Step 1 entered the NTESC2 as the first independent variable. Step 2 entered MHRS as the second independent variable.

Results from the multiple regression analysis are present in Table I. Table I includes the entire output from the stepwise multiple regression equation utilizing the SPSS/PC analytical package. Included in that output are not only the equation results per se but also output that assist in determining whether or not the assumptions necessary for the application of multiple regression have been violated. Four charts; Residual Statistics, Outliers-Standardized Residuals, Histogram-Standardized Residuals, and Normal Probibility

Plot all support the conclussion that the necessary assumption have not been violated and the results of the multiple regression equation are valid.

An examination of Table I Equation Number 1 reveals that when NTE General Knowledge (NTESC2) is entered into the equation as a single independent variable the results are not significant (F = 2.9526) and the only 2% of the variance can be accounted (R Square = .02382). However, on Equation 1 Block Number 2 when level of content preparation (MHRS) is added to the equation the results are significant (F = 42.53877) and more than 40% of the variance is accounted (R Square = .41486). The addition MHRS accounts for 39% of the variance (R Square Change = .39104 and F Change = 80.19323.)

Conclusion

The teacher's score on the NTE Mathematics Speciality Area Test increases as the Level of Content preparation increases when the NTE General Knowledge Score is controlled. The evidence supports the conclusion that the number of hours of mathematics taken as a part of teacher preparation is significantly more important to mathematics achievement than is general knowledge.

Table I

Pages 12 through 17

SPSS/PC+ Multiple Regression Program

Dependent Variable = NTE Mathematics Speciality Area Test Sscore

Independent Variable 1 = NTE General Knowledge Score (NTESC2)

Independent Variable 2 = Level of Content Preparation (MHRS)

Page 1 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. NTEMSC NTE Math Spec. Score

Beginning Block Number 1. Method: Enter NTESC2

Variable(s) Entered on Step Number
1.. NTESC2 General Knowledge Score

| | | | |
|---|---|---|---|
| Multiple R | .15433 | | |
| R Square | .02382 | R Square Change | .02382 |
| Adjusted R Square | .01575 | F Change | 2.95216 |
| Standard Error | 207.94832 | Signif F Change | .0883 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 1 | 127658.59139 | 127658.59139 |
| Residual | 121 | 5232343.03463 | 43242.50442 |

F = 2.95216 Signif F = .0883

Condition number bounds: 1.000, 1.000

Var-Covar Matrix of Regression Coefficients (B)
Below Diagonal: Covariance Above: Correlation

| | NTESC2 |
|---|---|
| NTESC2 | 2.81821 |

XTX Matrix

| | NTESC2 | NTEMSC | MHRS |
|---|---|---|---|
| NTESC2 | 1.00000 | -.15433 | .02951 |
| NTEMSC | .15433 | .97618 | .62506 |
| MHRS | -.02951 | .62506 | .99913 |

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. NTEMSC NTE Math Spec. Score

---------- Variables in the Equation ----------

| Variable | B | SE B | 95% Confdnce Intrvl B | | Beta |
|---|---|---|---|---|---|
| NTESC2 | 2.88440 | 1.67875 | -.43913 | 6.20794 | .15433 |
| (Constant) | -1423.20770 | 1113.14331 | -3626.96861 | 780.55321 | |

---------- Variables in the Equation ----------

| Variable | SE Beta | Correl | Part Cor | Partial | Tolerance | T | Sig T |
|---|---|---|---|---|---|---|---|
| NTESC2 | .08982 | .15433 | .15433 | .15433 | 1.00000 | 1.718 | .0883 |
| (Constant) | | | | | | -1.279 | .2035 |

---------- Variables not in the Equation ----------

| Variable | Beta In | Partial | Tolerance | Min Toler | T | Sig T |
|---|---|---|---|---|---|---|
| MHRS | .62560 | .63291 | .99913 | .99913 | 8.955 | .0000 |

End Block Number 1 All requested variables entered.

Page 3 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. NTEMSC NTE Math Spec. Score

Beginning Block Number 2. Method: Stepwise

Variable(s) Entered on Step Number
2.. MHRS Math Hours Taken

| | | | |
|---|---|---|---|
| Multiple R | .64409 | | |
| R Square | .41486 | R Square Change | .39104 |
| Adjusted R Square | .40510 | F Change | 80.19323 |
| Standard Error | 161.66776 | Signif F Change | .0000 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 2 | 2223626.02660 | 1111813.01330 |
| Residual | 120 | 3136375.59942 | 26136.46333 |

F = 42.53877 Signif F = 0.0

Condition number bounds: 1.001, 4.003

Var-Covar Matrix of Regression Coefficients (B)
Below Diagonal: Covariance Above: Correlation

| | NTESC2 | MHRS |
|---|---|---|
| NTESC2 | 1.70486 | .02951 |
| MHRS | .44144 | 131.24438 |

XTX Matrix

| | NTESC2 | MHRS | NTEMSC |
|---|---|---|---|
| NTESC2 | 1.00087 | .02954 | -.17279 |
| MHRS | .02954 | 1.00087 | -.62560 |
| NTEMSC | .17279 | .62560 | .58514 |

Page 4 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. NTEMSC NTE Math Spec. Score

---------- Variables in the Equation ----------

| Variable | B | SE B | 95% Confdnce Intrvl B | | Beta |
|---|---|---|---|---|---|
| NTESC2 | 3.22947 | 1.30570 | .64427 | 5.81467 | .17279 |
| MHRS | 102.59099 | 11.45619 | 79.90852 | 125.27346 | .62560 |
| (Constant) | -2287.54516 | 870.77016 | -4011.60947 | -563.48085 | |

---------- Variables in the Equation ----------

| Variable | SE Beta | Correl | Part Cor | Partial | Tolerance | T | Sig T |
|---|---|---|---|---|---|---|---|
| NTESC2 | .06986 | .15433 | .17271 | .22024 | .99913 | 2.473 | .0148 |
| MHRS | .06986 | .62050 | .62533 | .63291 | .99913 | 8.955 | .0000 |
| (Constant) | | | | | | -2.627 | .0097 |

End Block Number 2 POUT = .100 Limits reached.

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Summary table

| Step | MultR | Rsq | F(Eqn) | SigF | | Variable | Betain |
|---|---|---|---|---|---|---|---|
| 1 | .1543 | .0238 | 2.952 | .088 | In: | NTESC2 | .1543 |
| 2 | .6441 | .4149 | 42.539 | 0.0 | In: | MHRS | .6256 |

Page 5 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. NTEMSC NTE Math Spec. Score

Residuals Statistics:

| | Min | Max | Mean | Std Dev | N |
|---|---|---|---|---|---|
| *PRED | 173.5333 | 655.6977 | 489.1057 | 135.0053 | 123 |
| *RESID | -398.8442 | 409.2557 | .0000 | 160.3371 | 123 |
| *ZPRED | -2.3375 | 1.2340 | -.0000 | 1.0000 | 123 |
| *ZRESID | -2.4671 | 2.5315 | .0000 | .9918 | 123 |

Total Cases = 123

Durbin-Watson Test = 1.91709

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Outliers - Standardized Residual

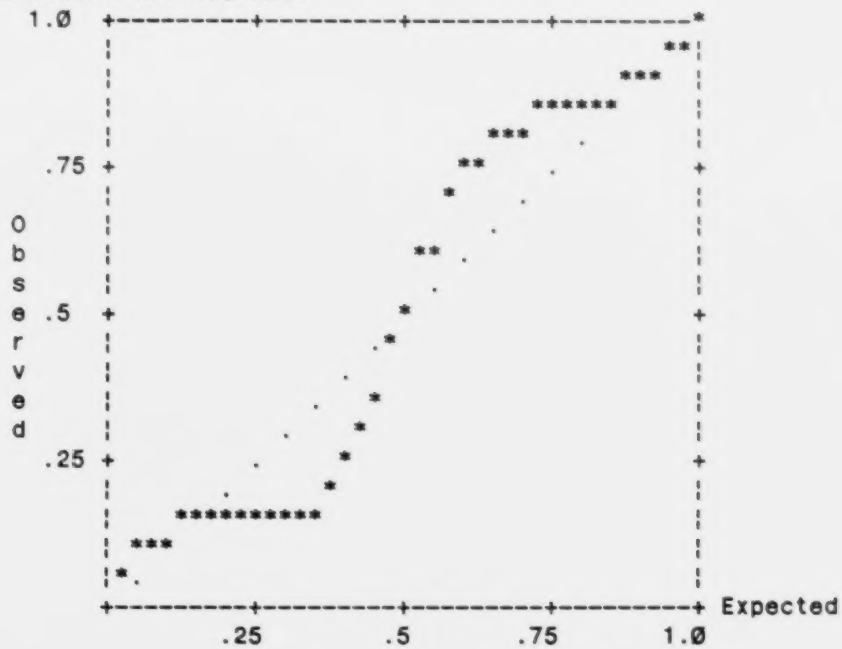
| Case # | *ZRESID |
|---|---|
| 116 | 2.53146 |
| 115 | 2.48582 |
| 94 | -2.46706 |
| 97 | 2.43544 |
| 59 | -2.41178 |
| 98 | -2.36718 |
| 37 | 2.25006 |
| 90 | -2.16742 |
| 84 | -2.14745 |
| 77 | -2.04757 |

Histogram - Standardized Residual

```
NExp N      (* = 1 Cases,     . : = Normal Curve)
Ø  .Ø9   Out
Ø  .19  3.ØØ
1  .48  2.67 *
3 1.1Ø  2.33 :**
3 2.24  2.ØØ *:*
4 4.11  1.67 ***:
2 6.75  1.33 **    .
4 9.92  1.ØØ ****      .
6 13.1   .67 ******        .
* 15.4   .33 ***************:****
* 16.3  Ø.Ø  ***************:************************
* 15.4  -.33 ***************:******
1 13.1  -.67 *             .
1 9.92 -1.ØØ *          .
3 6.75 -1.33 ***    .
8 4.11 -1.67 ***:****
2 2.24 -2.ØØ *:
4 1.1Ø -2.33 :***
Ø  .48 -2.67
Ø  .19 -3.ØØ
Ø  .Ø9   Out
```

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Normal Probability (P-P) Plot
Standardized Residual



Research Question 2

Can a level of content preparation be successfully inferred from performance on a cognitive achievement test in the teacher's speciality area?

Evidence

This portion of the study used the level of content preparation (MHRS) (see page 6) as the dependent variable in a stepwise multiple regression equation. The general knowledge score used was the teacher's score on the General Knowledge subscale of the NTE (NTESC2); it was entered as the first in dependent variable. The second independent variable was the teacher achievement in mathematics reported as the score on the NTE Mathematics Special Area Test. (NTEMSC)

Table II presents the results from the multiple regression analyses. As in the previous research question the entire output from the application of that technique is presented. Again, an examination of the four charts (Residual Statistics, Outliers, Histogram, and Normal Probability Plot) are examined for any violations of assumptions. In this instance with the Histogram and the Normal Probability Plot seem to indicate the assumptions of normality many have been violated and confidence in the strength of the conclusions are weakened.

Table II

Pages 20 through 26

SPSS/PC+ Multiple Regression Program

Dependent Variable = Level of Content Preparation MHRS

Independent Variable 1 = NTE General Knowledge Score (NTESC2)

Indepentent Variable 2 = NTE Mathematics Speciality Area Tests Score (NTEMSC)

Page 7 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. MHRS Math Hours Taken

Beginning Block Number 1. Method: Enter NTESC2

Variable(s) Entered on Step Number
1.. NTESC2 General Knowledge Score

| | | | |
|---|---|---|---|
| Multiple R | .02951 | | |
| R Square | .00087 | R Square Change | .00087 |
| Adjusted R Square | -.00739 | F Change | .10547 |
| Standard Error | 1.28289 | Signif F Change | .7459 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 1 | .17359 | .17359 |
| Residual | 121 | 199.14348 | 1.64581 |

F = .10547 Signif F = .7459

Condition number bounds: 1.000, 1.000

Var-Covar Matrix of Regression Coefficients (B)
Below Diagonal: Covariance Above: Correlation

| | NTESC2 |
|---|---|
| NTESC2 | 1.0726E-04 |

XTX Matrix

| | NTESC2 | MHRS | NTEMSC |
|---|---|---|---|
| NTESC2 | 1.00000 | .02951 | -.15433 |
| MHRS | -.02951 | .99913 | .62506 |
| NTEMSC | .15433 | .62506 | .97618 |

Page 8 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. MHRS Math Hours Taken

---------- Variables in the Equation ----------

| Variable | B | SE B | 95% Confdnce Intrvl B | | Beta |
|---|---|---|---|---|---|
| NTESC2 | -3.36352E-03 | .01036 | -.02387 | .01714 | -.02951 |
| (Constant) | 8.42508 | 6.86730 | -5.17055 | 22.02071 | |

---------- Variables in the Equation ----------

| Variable | SE Beta | Correl | Part Cor | Partial | Tolerance | T | Sig T |
|---|---|---|---|---|---|---|---|
| NTESC2 | .09087 | -.02951 | -.02951 | -.02951 | 1.00000 | -.325 | .7459 |
| (Constant) | | | | | | 1.227 | .2223 |

---------- Variables not in the Equation ----------

| Variable | Beta In | Partial | Tolerance | Min Toler | T | Sig T |
|---|---|---|---|---|---|---|
| NTEMSC | .64031 | .63291 | .97618 | .97618 | 8.955 | .0000 |

End Block Number 1 All requested variables entered.

Page 9 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. MHRS Math Hours Taken

Beginning Block Number 2. Method: Stepwise

Variable(s) Removed on Step Number
2.. NTESC2 General Knowledge Score

| | | | |
|---|---|---|---|
| Multiple R | 0.0 | | |
| R Square | 0.0 | R Square Change | -.00087 |
| Adjusted R Square | 0.0 | F Change | .10547 |
| Standard Error | 1.27818 | Signif F Change | .7459 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 0 | 0.0 | 0.0 |
| Residual | 122 | 199.31707 | 1.63375 |

F is undefined

XTX Matrix

| | MHRS | NTESC2 | NTEMSC |
|---|---|---|---|
| MHRS | 1.00000 | -.02951 | .62050 |
| NTESC2 | -.02951 | 1.00000 | .15433 |
| NTEMSC | .62050 | .15433 | 1.00000 |

---------- Variables not in the Equation ----------

| Variable | Beta In | Partial | Tolerance | Min Toler | T | Sig T |
|---|---|---|---|---|---|---|
| NTESC2 | -.02951 | -.02951 | 1.00000 | 1.00000 | -.325 | .7459 |
| NTEMSC | .62050 | .62050 | 1.00000 | 1.00000 | 8.704 | .0000 |

Page 10 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. MHRS Math Hours Taken

Variable(s) Entered on Step Number
3.. NTEMSC NTE Math Spec. Score

| | | | |
|---|---|---|---|
| Multiple R | .62050 | | |
| R Square | .38503 | R Square Change | .38503 |
| Adjusted R Square | .37994 | F Change | 75.75603 |
| Standard Error | 1.00649 | Signif F Change | .0000 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 1 | 76.74210 | 76.74210 |
| Residual | 121 | 122.57498 | 1.01302 |

F = 75.75603 Signif F = .0000

Condition number bounds: 1.000, 1.000

Var-Covar Matrix of Regression Coefficients (B)
Below Diagonal: Covariance Above: Correlation

| | NTEMSC |
|---|---|
| NTEMSC | 1.8900E-07 |

XTX Matrix

| | NTEMSC | MHRS | NTESC2 |
|---|---|---|---|
| NTEMSC | 1.00000 | -.62050 | -.15433 |
| MHRS | .62050 | .61497 | -.12527 |
| NTESC2 | .15433 | -.12527 | .97618 |

Page 11 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. MHRS Math Hours Taken

---------- Variables in the Equation ----------

| Variable | B | SE B | 95% Confdnce Intrvl B | | Beta |
|---|---|---|---|---|---|
| NTEMSC | 3.783854E-03 | 4.34736E-04 | 2.923179E-03 | 4.644529E-03 | .62050 |
| (Constant) | 4.34442 | .23119 | 3.88672 | 4.80212 | |

---------- Variables in the Equation ----------

| Variable | SE Beta | Correl | Part Cor | Partial | Tolerance | T | Sig T |
|---|---|---|---|---|---|---|---|
| NTEMSC | .07129 | .62050 | .62050 | .62050 | 1.00000 | 8.704 | .0000 |
| (Constant) | | | | | | 18.792 | .0000 |

---------- Variables not in the Equation ----------

| Variable | Beta In | Partial | Tolerance | Min Toler | T | Sig T |
|---|---|---|---|---|---|---|
| NTESC2 | -.12833 | -.16168 | .97618 | .97618 | -1.795 | .0752 |

End Block Number 2 PIN = .050 Limits reached.

**********

Summary table

| Step | MultR | Rsq | F(Eqn) | SigF | | Variable | Betain |
|---|---|---|---|---|---|---|---|
| 1 | .0295 | .0009 | .105 | .746 | In: | NTESC2 | -.0295 |
| 2 | 0.0 | 0.0 | 0.0 | 1.000 | Out: | NTESC2 | |
| 3 | .6205 | .3850 | 75.756 | .000 | In: | NTEMSC | .6205 |

Page 12 SPSS/PC+ Site:Mississippi State Univ. 90012 11/3/87

**** MULTIPLE REGRESSION ****

Equation Number 1 Dependent Variable.. MHRS Math Hours Taken

Residuals Statistics:

| | Min | Max | Mean | Std Dev | N |
|---|---|---|---|---|---|
| *PRED | 4.3444 | 7.3337 | 6.1951 | .7931 | 123 |
| *RESID | -3.6526 | 1.8015 | -.0000 | 1.0024 | 123 |
| *ZPRED | -2.3335 | 1.4355 | .0000 | 1.0000 | 123 |
| *ZRESID | -3.6290 | 1.7899 | -.0000 | .9959 | 123 |

Total Cases = 123

Durbin-Watson Test = 2.03149

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Outliers - Standardized Residual

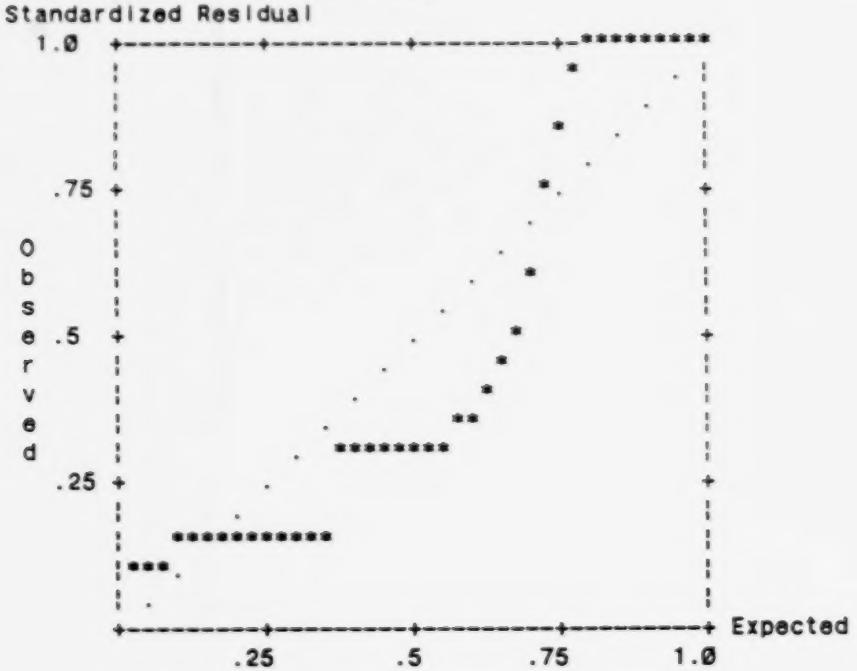
| Case # | *ZRESID |
|---|---|
| 97 | -3.62903 |
| 116 | -3.55384 |
| 115 | -2.74826 |
| 123 | -2.37231 |
| 81 | -2.37231 |
| 67 | -2.37231 |
| 44 | -2.37231 |
| 111 | -2.25953 |
| 74 | -2.25953 |
| 37 | -2.13065 |

Histogram - Standardized Residual

```
NExp N      (* = 1 Cases,     . : = Normal Curve)
0  .09   Out
0  .19  3.00
0  .48  2.67
0 1.10  2.33 .
0 2.24  2.00  .
1 4.11  1.67 *  .
0 6.75  1.33       .
1 9.92  1.00 *         .
* 13.1   .67 ************.**********************************
* 15.4   .33 ***************.******************
6 16.3  0.0  ******          .
* 15.4  -.33 ***************.
2 13.1  -.67 **            .
0 9.92 -1.00            .
6 6.75 -1.33 ******.
2 4.11 -1.67 ** .
2 2.24 -2.00 *:
6 1.10 -2.33 :*****
1  .48 -2.67 *
0  .19 -3.00
2  .09   Out **
```

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Normal Probability (P-P) Plot
Standardized Residual



An examination of Table II chart, "Equation 1, Step Number 1" reveals that when NTE General Knowledge (NTESC2) is entered into the multiple regression equation as a single independent variable the results are not significant (F = 0.1057) and almost none of the variance is accounted (R Square = .00087). However, when the NTE Speciality Areas in Mathematics (NTEMSC) score is added to chart "Equation Number 1, Step Number 3" the equation the results are significant (F = 75.75603) and more than 38% of the variance is accounts (F Square = .38503). The addition of NTEMSC accounts for 38% of the variance (F Change = 75.75603 and R Square Change = .38503).

Table III provides supporting evidence for a response to question 2. In Table III teachers with the same level of content preparation have been grouped and means and standard deviations have been computed for those groups. We find that group 1, 2, 9 & 10 had no teachers in them. These groups include teachers with less than 7 hours credit or with up to 30 hours or more above the master degree. Further, only 3 teachers were in group 3 (7-17 hours) and one teacher was in group 8 (MA or MS in Math). Group 4 through 6 and somewhat group 8 indicate a significant rise in NTEMSC mean scores as the hours of mathematics increase in the level of content preparation. Group 4 (18-23) NTE = 201.05,

Table III

Mean NTE Matheamtics Speciality Area Scores for SEIL Math Teachers Grouped by Level of Conent Preparation

| Level of Content | Number | Mean | Standard Direction |
|---|---|---|---|
| 1. 0-18 hours-general math | 0 | | |
| 2. 6 hours-college | 0 | | |
| 3. 7-17 hours-college | 3 | 400.00 | 346.55 |
| 4. 18-23-hours college | 19 | 201.05 | 271.64 |
| 5. 24-30 hours-college | 14 | 379.29 | 299.22 |
| 6. BA or 42 hours | 3 | 583.33 | 70.24 |
| 7. BS or 42 hours | 83 | 573.37 | 53.27 |
| 8. MA or MS Math | 1 | 490.00 | - |
| 9. Up to 30 above MA or MS | 0 | | |
| 10. More than 30 above MA or MS | 0 | | |

Group 5 (24-30) NTE = 379.29, Group 6 (BA or 31-41 hours), NTE = 583.33 and Group 7 (BS or 42) NTE = 573.37. It is significant to note also that group 6 & 7 show extreme drops in standard derivation.

Conclusion

The preponderence of evidence supports the conclusion that a level of content preparation may be inferred from the applicant teacher's score on the NTE Mathematics Speciality test score. However, the results of this results should be independently replicated using a larger group of teachers before a specific level of preparation is directly derived from an NTE Mathematics Speciality area score.

Summary

Utilizing 123 teachers recently certified to teach mathematics in a mid-south state the researcher was able to show that teachers achievement score an the NTE Mathematics Speciality Area test significantly increased as the teachers level of mathematics content preparation increased when general knowledge, as measured by the NTE G.K., was controlled. Further, evidence presented tentatively supports the conclusion that a level of mathematics content preparation can be inferred from an NTE Mathematics Speciality Area score. However, there must be more research completed before we can conclude

that a specific level of content preparation can be inferred from an NTE Mathematics Speciality test score.

References

Adelman, N. E. (1986). An exploratory study of teacher alternative certification and retraining programs, Washington, DC: Policy Studies Associates, Inc.

American Association of Colleges for Teacher Education (1985). Alternative certification: A position statement of AACTE. Journal of Teacher Education, 36,(3), 24.

American Association of Colleges for Teacher Education (1987). Teacher education policy in the states: 50-state survey of legislative and administrative actions. Washington, DC: Author.

Ary, D., Jacobs, L. C. & Razarial, A. (1985). Introduction to Research in Education. New York: Holt Rinehart and Winston.

Cornett, L. M. (1983). Preparation programs and certification standards for teachers of science and mathematics in the SREB region. Atlanta, GA: Southern Regional Education Board.

Evertson, C. M., Hawley, W. D., & Zlotnik, M. (1985). Making a difference in educational quality through teacher education. Journal of Teacher Education, 36,(3), 3-12.

Hawk, P. P., Coble, C. R., & Swanson, M. (1985). Certification: It does matter. Journal of Teacher Education, 36(3), 13-15.

Mason, R. D., Lind, D. A., & Manlel, W. G. (1983). Statistics An Introductory. New York: Harcourt, Brace, Yovanovich.

Patton, J. M. (1985). Alternative approaches to the certification of teachers. A paper presented to the 1985 Virginian Association of Colleges of Teacher Education. (ERIC Document Reproduction Service No. ED 265-121).)

Report of the state commission on alternative teacher certification (1984). Trenton, NJ (ERIC Document Reproduction Service No. ED 262-021.)

Roth, R. A. (1986). Emergency certificates, misassignment of teachers, and other' dirty little secrets'. Phi Delta Dappan, 67(10), 725-727.